

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/GB04/005144

International filing date: 07 December 2004 (07.12.2004)

Document type: Certified copy of priority document

Document details: Country/Office: GB
Number: 0400206.9
Filing date: 07 January 2004 (07.01.2004)

Date of receipt at the International Bureau: 17 February 2005 (17.02.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse



PCT/GB2004/005144



INVESTOR IN PEOPLE

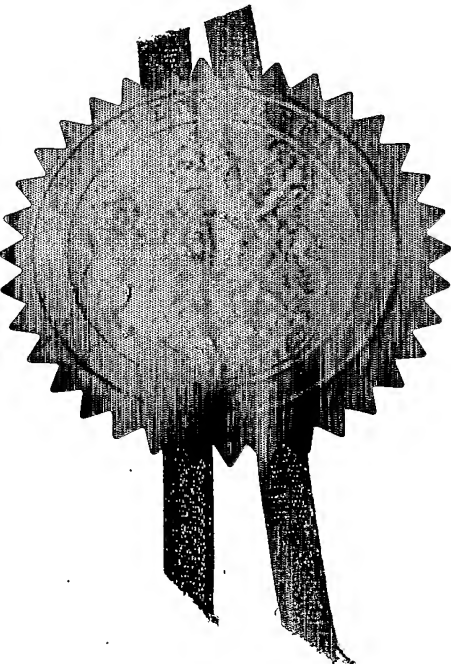
The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed

W. Evans

Dated

16 December 2004





1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

07JAN04 EB63514-1 B19930

2. Patent application number

(The Patent Office will fill this part in)

0400206.9

1/7700 0.00-0400206.9 NONE

3. Full name, address and postcode of the or of each applicant (underline all surnames)

C-Tech Innovation Ltd
Capenhurst Technology Park
Capenhurst
CHESTER CH1 6EH

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

UK 8510331001

4. Title of the invention

SILENT KETTLE

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Patents ADP number (if you know it)

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)

Number of earlier UK application

Date of filing
(day / month / year)

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

No

Answer YES if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

Otherwise answer NO (See note d)

9. Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form	0
Description	4
Claim(s)	1
Abstract	1
Drawing(s)	1 + 1 SN

10. If you are also filing any of the following, state how many against each item.

Priority documents	-
Translations of priority documents	-
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	-
Request for a preliminary examination and search (Patents Form 9/77)	-
Request for a substantive examination (Patents Form 10/77)	-
Any other documents (please specify)	-

11. I/We request the grant of a patent on the basis of this application.

Signature(s) *Mike Harrison*

Date 5-1-04

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

MI HARRISON
0151 347 2909
mike.harrison@capenhurst.com

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered YES in part 8, a Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- Part 7 should only be completed when a divisional application is being made under section 15(4), or when an application is being made under section 8(3), 12(6) or 37(4) following an entitlement dispute. By completing part 7 you are requesting that this application takes the same filing date as an earlier UK application. If you want the new application to have the same priority date(s) as the earlier UK application, you should also complete part 6 with the priority details.

Silent Kettle

This invention relates to a silent kettle that heats water by passing an electric current through the water, resulting in a heating of the water but with minimal noise generation.

Kettles are well known devices for boiling water. In particular kettles are often powered by electrical energy, being a clean and convenient power source. Kettles are currently designed to give maximum heating rates and efficiency, as well as having an appealing aesthetic appearance. The most usual way to apply electrical energy to heat water in a kettle is via heating elements.

The use of heating elements to rapidly heat water gives high temperature gradients between the element and the water in contact with the heating element, this together with the fact that the heating element provide nucleation points for bubble formation, leads to the creation of many small bubbles of steam which then collapse in the bulk water producing a noise.

A particular technique for heating water known as 'ohmic heating' can be used to heat fluids such as water, and in particular can be used to heat water in a kettle. Heating water using ohmic heating allows rapid highly efficient heating of the water. Ohmic heating heats a fluid highly uniformly, and without any surfaces becoming hot, and thus the use of ohmic heating does not result in the formation of bubbles of steam throughout the majority of the heating cycle, and thus the operation of an ohmically heated kettle is virtually silent, (until the full bulk of the water boils, at which time the heating operation is complete).

Arrangements are known where current is passed through a liquid to cause it to heat. However, ohmic heating is not known to be used to heat fluids for the purpose of heating the fluid silently. Furthermore this technique for heating water will not lead to the formation of precipitates ('furring') in the kettle.

FR964733 discloses an ohmic heater for heating a fluid by passing electricity through it.

According to the present invention there is provided a kettle for heating water or other liquids, incorporating two electrodes, which are energised by connection to a single-phase (or two phases of a three phase) electrical power supply. The electrodes when energised cause current to be passed through the water causing it to be heated (due to its own electrical resistivity). The passage of this electrical current causes the water to be heated but without the formation of bubbles which lead to noise generation. Thus a rapid and silent kettle.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing, which shows a possible arrangement of a silent, ohmically heated kettle.

Referring to the drawing which illustrates an embodiment of the present invention in which electrodes 2 & 3 are arranged to be parallel to the base of the kettle and separated by a distance appropriate to cause a current to be drawn, during normal operation, such as to be at the limit of the electrical supply available to power the kettle; typically a 13 Amp single phase domestic supply. This electrical supply is connected to the electrodes by contact wires 6.

The kettle comprises a kettle main body 1, two electrodes to transfer the electrical power to the water 2 & 3, a lid for the kettle 5 which is interlocked with the main electricity supply to prevent accidental contact of the operator with the electrodes within the kettle. The lid also helps to contain any steam produced during the heating and boiling process. The kettle also comprises a filter unit 4 on the output of the kettle spout, which in addition to its role as a filter, also acts as a device to prevent accidental contact of the operator with the electrodes.

The kettle main body 1 is constructed from a suitable electrically insulating material and of such a wall thickness as to adequately withstand the internal temperatures and pressures which will occur during the heating of the water - for example when the water boils.

The two electrodes 2 and 3 are constructed from a suitable material, chosen so as to minimise corrosion of said electrodes during operation of the kettle, and also to minimise any electrochemical effects which may occur during the heating process. Electrochemical gas generation during normal operation will be very small; any gases produced during the heating process will become mixed with the steam produced by the boiling water and will then be dispersed into the surrounding environment, thus no build-up of gas will occur.

The electrodes 2 and 3 may be made from any suitable material that is compatible with the chemical and electrochemical properties of the fluid to be heated. In general there will be an upper limit to the current density, which any particular electrode material will withstand without damaging the current carrying portion of the electrode or causing the water to react at the electrode surface and adversely affect the operation of the kettle.

One electrode 2 is integral to the base of the kettle. This electrode is connected to the live electrical supply. The other electrode 3, which can be constructed from a solid plate or a perforated plate or mesh, is positioned parallel to the base electrode at an appropriate separation so as to ensure that the current drawn through the water between the two electrodes is at such a level for optimal performance of the kettle.

The dimensions of the electrodes and their spacing also needs to be chosen in such a way as to limit the currents flowing to levels which the electrode / water combination can withstand. Suitable electrode materials have been found to be platinized titanium and various graphite based material. Other materials, which may be chosen to be used, may include steel, stainless steel and titanium. In particular the use of wire or mesh makes easier the process of applying coatings to the electrode materials, so as to improve its performance as an electrode material. Such coatings may include platinum, or doped diamond coatings.

The use of a perforated or mesh neutral electrode permits any gases evolved to rise up out from between the electrodes, and also allows the water to circulate around the kettle more freely, by natural convection, thus giving a more uniform heat distribution in the water in the kettle, prevented boiling from occurring in localised regions in the kettle, and hence ensuring the silent operation of the kettle.

Suitable dimensions for the electrodes of an ohmically heated, silent kettle are 100mm diameter plates (with 6mm diameter perforations) separated by a distance of 15mm.

Alternative arrangements for the electrodes in the silent kettle include parallel electrodes in a vertical orientation (rather than the horizontal arrangement described above), and also concentric electrodes, (where the electrode connected to the live electricity supply would usually be the inner electrode with the neutral electrode positioned around it).

In order to maximise the heating power input to the water in the silent kettle, it is beneficial to include a method of tuning the kettle to suit the particular water being heated at any time. The electrical conductivity of potable water varies across different regions / countries, dependant on how the water is sourced. Tuning of the kettle will be required to ensure that the kettle operates at maximum power dependant upon the conductivity of the water to be heated. Tuning can be performed by mechanical or electronic means, and can be performed continuously throughout the heating cycle or can be performed before heating occurs as a one off operation.

Mechanical tuning techniques include varying the separation of the electrodes or the electrode area, and are particularly suitable for one off tuning operations. The electrode separation can be varied to such a position such as to cause the current being drawn, during normal operation, to be at the limit of the electrical supply available to power the kettle; typically a 13 Amp single phase domestic supply. This can be done using cold water straight from the water supply, and the optimum position can be indicated by comparing the resistance of the water between the electrodes to a fixed resistance of appropriate magnitude for the electrical supply to be used.

A number of electronic tuning techniques can be used, such as a system where the current being drawn is monitored and is used to control the active area of the electrodes being used, for example by using a number of

concentric electrodes which can be switched on or off so as to give the appropriate electrode area for the water being heated.

Other techniques for optimising heating rates include the use of parallel or series resistance elements to act as an electrical ballast.

Other devices which may be incorporated in a silent ohmically heated kettle include a means of making and breaking the electrical contact to the neutral electrode, so that an electric circuit is only made when the kettle's lid is fitted correctly, and is broken when the lid is removed. This will prevent accidental contact of the kettle's operator with the electrodes or water within the kettle. The kettle should also comprise a filter unit on the output of the kettle spout, which in addition to its role as a filter, also acts as a device to prevent accidental contact of the operator with the electrodes.

Additionally a tilt switch may be added which will cut the electrical power to the kettle when it is tilted, for example to pour out the water. This will prevent water being poured out of the kettle whilst electrical power is connected.

As well as using the described heating arrangement, tuning and safety systems for a silent kettle, the systems described can also be used for heating water (and other liquids) in equipment such as in-line water heaters, coffee machines and showers. The technique will also be beneficial in that it will heat water without the formation of precipitates ('furring') in the kettle.

CLAIMS

- 1 A heating device for water or other liquids, incorporating two electrodes, which are energised by connection to a single-phase (or two phases of a three phase) electrical power supply, the electrodes when energised cause current to be passed through the water causing it to be heated (due to its own electrical resistivity), the passage of this electrical current causes the water to be heated but without the formation of bubbles which lead to noise generation, thus a rapid and silent kettle
- 2 A method of operating an ohmically heated silent kettle as claimed in Claim 1 wherein the current between electrodes 2 and 3 can be varied by the adjustment of the separation of said electrodes to tune the kettle for optimum performance
- 3 A method of operating an ohmically heated silent kettle as claimed in Claim 1 wherein the current between electrodes 2 and 3 can be varied by the adjustment of the area of said electrodes to tune the kettle for optimum performance
- 4 A method of operating an ohmically heated silent kettle as claimed in Claim 1 wherein the current between electrodes 2 and 3 can be varied by electronic monitoring and control techniques to tune the kettle for optimum performance
- 5 An ohmically heated silent kettle as claimed in Claim 1 wherein said vessel is electrically insulating
- 6 A silent heating technique which could be employed for heating water (and other liquids) in equipment such as in-line water heaters, coffee machines and showers.
- 7 A silent heating technique for heating water causes the heating of the water without the formation of precipitates ('furring')

ABSTRACT

Silent Kettle

A kettle, for heating water or other liquids, which utilises ohmic heating of the water within the kettle, where electrical current is passed directly through the water which becomes heated due to its natural electrical resistivity. The passage of the electrical current through the water causes it to be heated rapidly and efficiently but without the formation of bubbles that lead to noise generation. Thus a rapid and silent kettle.

1/1

